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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/988,706

Applicant(s)

NUMATA ET AL.

Examiner

Dalzid Singh

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 February 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Forrest et al (US Patent No. 4,709,413) in view of Marcuse et al (US Patent No. 5,699,464) and further in view of Cunningham et al (US Patent No. 6,304,352).

Regarding claim 1, Forrest et al disclose an optical transmission system (fig. 2) for transmitting an optical signal from terminal (10) (including transmitter (16), col. 3, lines 11-15) to a terminal (12, including detector (22), col. 3, lines 20-23) through a multi-mode fiber (col. 3, line 34), wherein the terminal (transmitter) (10) comprises:

a light emission element (16, col. 3, line 18) for generating an optical signal; and
at least one lens ((30), col. 4, line 33-35) for converging the optical signal generated by the light emission element to focus at a focal point (col. 4, lines 36-39).
wherein:

the optical signal converged by the at least one lens (such 30, see fig. 2) enters an input plane of the multi-mode fiber (14) to propagate through the multi-mode fiber (col. 3, lines 63-67), and is outputted from an output plane of the multi-mode fiber at the other end (end at 12);

a receiver (such terminal 12, col. 3, lines 20-23) comprising a light receiving element (22) for receiving the optical signal outputted from the multi-mode fiber (14), wherein

an optical axis of said at least one lens is aligned with a fiber axis of the multimode fiber (fig. 2 and col. 4, lines 36-44; it would have been obvious that the optical axis of the lens is aligned to the fiber in order to maximized transfer of optical signal).

Forrest et al disclose optical transmission system as discussed above and differ from the claimed invention in that Forest et al do not specifically disclose a vertex of said at least one lens is located at a first predetermined distance from the input plane of the multi-mode fiber, the first predetermined distance being greater or less than a distance from the vertex of said at least one lens to a focal point of said at least one lens. However, arranging proper placement of the lens with respect to the multi-mode fiber optical cable is well known. Marcuse et al is cited to show such well known concept. In Fig. 6, and col. 3, lines 54-67 to col. 4, lines 1-25, Marcuse et al teach placement of the lens (62) with respect to the fiber (60). In such arrangement a point on the outer surface of the lens can be considered as the vertex of the lens, which has a predetermined distance (the predetermined distance is slightly greater than D_m , shown by the end point of the arrow (R)) from input plane of the fiber (the input of the plane of the fiber is the end of the fiber). Marcuse et al show that the first predetermined distance being is greater than the distance from the vertex of said at least one lens to a focal point of said at least one lens (F_r). Therefore, it would have been obvious to an

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artisan of ordinary skill in the art at the time the invention was made to arrange such placement of the lens with respect to the fiber. One of ordinary skill in the art would have been motivated to do such in order to maximize coupling efficiency.

Furthermore, the combination of Forrest et al and Marcuse et al differs from the claimed invention in that the combination does not disclose that the first predetermined distance is selected based on an eye opening factor of the multi-mode fiber and a power of the optical signal. However, it is well known to select such predetermined using various method of testing such as eye-opening factor and power. The testing method show how efficient the coupling of the lens with respect to the fiber.

Cunningham et al is cited to show such well known concept. In col. 8, lines 3-31, Cunningham et al teach the use of eye opening diagrams (see figs. 7A-7D) in multi-mode fiber. Therefore, it would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to perform testing and experiment using eye opening (diagrams) in order to locate an optimum placement off the lens with respect to the multi-mode fiber. One of ordinary skill in the art would have been motivated to do such in order to prevent coupling losses and provide maximum coupling efficiency.

Regarding claim 2, Forrest (fig. 2) shows the input plane (of fiber 14) is placed at a position farther away from the at least one lens than the focal point.

2. Claims 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Forrest et al (US Patent No. 4,709,413) in view of Marcuse et al (US Patent No. 5,699,464).

Regarding claim 3, Forrest discloses an optical transmission system (fig. 2) for transmitting an optical signal from terminal (10) (including transmitter (16), col. 3, lines 11-15) to a terminal (12, including detector (22), col. 3, lines 20-23) through a multi-mode fiber (col. 3, line 34), wherein the terminal (transmitter) (10) comprises:

- a light emission element (16, col. 3, line 18) for generating an optical signal; and
- at least one lens (30, col. 4, line 33-35) for converging the optical signal generated by the light emission element to focus at a focal point (col. 4, lines 36-39).

wherein

the optical signal converged by the at least one lens (such 30, see fig. 2) enters an input plane of the multi-mode fiber (14) to propagate through the multi-mode fiber (col, 3, lines 63-67), and is outputted from an output plane of the multi-mode fiber at the other end (end at 12); and,

an optical axis of said at least one lens is aligned with a fiber axis of the multimode fiber (fig. 2 and col. 4, lines 36-44; it would have been obvious that the optical axis of the lens is aligned to the fiber in order to maximized transfer of optical signal).

Forrest et al disclose optical transmission system as discussed above and differ from the claimed invention in that Forest et al do not specifically disclose a vertex of said at least one lens is located at a first predetermined distance from the input plane of the multi-mode fiber, the first predetermined distance being greater or less than a distance from the vertex of said at least one lens to a focal point of said at least one lens. However, arranging proper placement of the lens with respective to the multi-

mode fiber optical cable is well known. Marcuse et al is cited to show such well known concept. In Fig. 6, and col. 3, lines 54-67 to col. 4, lines 1-25, Marcuse et al teach placement of the lens (62) with respect to the fiber (60). In such arrangement a point on the outer surface of the lens can be considered as the vertex of the lens, which has a predetermined distance (the predetermined distance is slightly greater than D_m , shown by the end point of the arrow (R)) from input plane of the fiber (the input of the plane of the fiber is the end of the fiber). Marcuse et al show that the first predetermined distance being is greater than the distance from the vertex of said at least one lens to a focal point of said at least one lens (F_r). Therefore, it would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to arrange such placement of the lens with respect to the fiber. One of ordinary skill in the art would have been motivated to do such in order to maximize coupling efficiency.

Regarding claim 4, Forrest (fig. 2) shows the input plane (of fiber 14) is placed at a position farther away from the at least one lens than the focal point.

Regarding claim 5, Forrest (fig. 2) shows element (22) (in associated with hole (74), col, 4, lines 42-44) as a receptacle for connecting to the multi-mode fiber to affix the input plane (of fiber) at a position other than the focal point.

3. Claims 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Forrest et al (US Patent No. 4,709,413) in view of Marcuse et al (US Patent No. 5,699,464) and further in view of Auracher (US Patent No. 3,980,392).

Regarding claim 6, Forrest discloses an optical transmission system (fig. 2) for transmitting an optical signal from terminal (10) (including transmitter (16), col. 3, lines 11-15) to a terminal (12, including detector (22), col. 3, lines 20-23) through a multi-mode fiber (col. 3, line 34), wherein the terminal (transmitter) (10) comprises:

- a light emission element (16, col. 3, line 18) for generating an optical signal; and
- at least one lens (30, col. 4, line 33-35) for converging the optical signal generated by the light emission element to focus at a focal point (col. 4, lines 36-39).

wherein:

- the optical signal converged by the at least one lens (such 30, see fig. 2) enters an input plane of the multi-mode fiber (14) to propagate through the multi-mode fiber (col. 3, lines 63-67), and is outputted from an output plane of the multi-mode fiber at the other end (end at 12);

- the receiver (such terminal 12, col. 3, lines 20-23) comprises a light receiving element (22) for receiving the optical signal outputted from the multi-mode fiber (14); and the input plane is placed at a position (at the center of hole 32, see fig. 2, col. 3, lines 63-67) other than the focal point, and the light receiving plane (26) of the light receiving element is placed at a predetermined distance from the output plane (of fiber) (also fig. 2, col. 4, lines 40-44); and

- a receptacle (such (22), in associated with hole (74)), for connecting to the multimode fiber to affix the output plane at a predetermined distance from the light-receiving plane (26) (see fig. 2, col. 4, lines 40-44).

Forrest et al differ from the claimed invention in that Forrest et al do not specifically disclose that a predetermined distance is determined based on a core diameter of the multi-mode fiber, a diameter of the light-receiving plane, and a maximum angle among angles of modes of the optical signal outputted from the output plane of the multi-mode fiber which are capable of entering the light-receiving plane. However, arrangement of optical lens, such as lens for receiving light, relative to the multi-mode fiber optical cable is well known. Marcuse et al is cited to show such well known concept. In col. 3, lines 54-67 and col. 4, lines 1-25, Marcuse et al teach mathematical relationship between diameter of fiber core, radius of glass (lens) and refractive index (angles of the optical signal). Therefore, it would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to arrange placement of the lens and fiber in relation to each other. One of ordinary skill in the art would have been motivated to do such in order to maximize coupling efficiency.

Furthermore, the combination of Forrest et al and Cunningham et al disclose the use of multi-mode fiber and differs from the claimed invention in that the combination do not specifically disclose that the light receiving element receives a lower order mode of the optical signal and a higher order mode is prevented from entering the light-receiving plane of said light receiving element. However, since the multi-mode fiber carries different modes of optical signal, it is well known to provide a filter to select a particular mode. Auracher is cited to show such well known concept. In col. 1, lines 30-45, Auracher et al teach the use of mode filter to block a particular mode. Therefore, it would have been obvious to an artisan of ordinary skill in the art at the time the

invention was made to select a particular mode and prevent other mode. One of ordinary skill in the art would have been motivated to do such in order to eliminate noise associated with particular signal.

Regarding claim 7, the light receiving element of Forrest is a Si PIN photodiode (col. 12, lines 22-23).

Regarding claim 8, Forrest discloses a photodetector (receiver) (22, see fig. 2, col. 3, lines 14-15 and lines 21-22) for receiving an optical signal outputted (such beam (24)) from a multi-mode fiber (14), comprising:

a light receiving element having a light-receiving plane (26) for receiving the optical signal from an output plane of the multi-mode fiber (14) (col. 3, lines 34-37) and a receptacle (such (22), in associated with hole (74)), for connecting to the multimode fiber to affix the output plane at a predetermined distance from the light-receiving plane (26) (see fig. 2, col. 4, lines 40-44).

Forrest et al differ from the claimed invention in that Forrest et al do not specifically disclose that a predetermined distance is determined based on a core diameter of the multi-mode fiber, a diameter of the light-receiving plane, and a maximum angle among angles of modes of the optical signal outputted from the output plane of the multi-mode fiber which are capable of entering the light-receiving plane. However, arrangement of optical lens, such as lens for receiving light, relative to the multi-mode fiber optical cable is well known. Marcuse et al is cited to show such well known concept. In col. 3, lines 54-67 and col. 4, lines 1-25, Marcuse et al teach mathematical relationship between diameter of fiber core, radius of glass (lens) and

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refractive index (angles of the optical signal). Therefore, it would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to arrange placement of the lens and fiber in relation to each other. One of ordinary skill in the art would have been motivated to do such in order to maximize coupling efficiency.

Furthermore, the combination of Forrest et al and Cunningham et al disclose the use of multi-mode fiber and differs from the claimed invention in that the combination do not specifically disclose that the light receiving element receives a lower order mode of the optical signal and a higher order mode is prevented from entering the light-receiving plane of said light receiving element. However, since the multi-mode fiber carries different modes of optical signal, it is well known to provide a filter to select a particular mode. Auracher is cited to show such well known concept. In col. 1, lines 30-45, Auracher et al teach the use of mode filter to block a particular mode. Therefore, it would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to select a particular mode and prevent other mode. One of ordinary skill in the art would have been motivated to do such in order to eliminate noise associated with particular signal.

4. Claims 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Forrest et al (US Patent No. 4,709,413) in view of Marcuse et al (US Patent No. 5,699,464) further in view of Cunningham et al (US Patent No. 6,304,352) and further in view of Auracher (US Patent No. 3,980,392).

Regarding claim 9, Forrest discloses an optical transmission system (fig. 2) for transmitting an optical signal from terminal (10) (including transmitter (16), col. 3, lines 11-15) to a terminal (12, including detector (22), col. 3, lines 20-23) through a multi-mode fiber (col. 3, line 34), wherein the terminal (transmitter) (10) comprises:

- a light emission element (16, col. 3, line 18) for generating an optical signal; and
- at least one lens (30, col. 4, line 33-35) for converging the optical signal generated by the light emission element to focus at a focal point (col. 4, lines 36-39).

wherein:

- the optical signal converged by the at least one lens (such 30, see fig. 2) enters an input plane of the multi-mode fiber (14) to propagate through the multi-mode fiber (col, 3, lines 63-67), and is outputted from an output plane of the multi-mode fiber at the other end (end at 12);

- an optical axis of said at least one lens is aligned with a fiber axis of the multimode fiber (fig. 2 and col. 4, lines 36-44; it would have been obvious that the optical axis of the lens is aligned to the fiber in order to maximized transfer of optical signal);

- a receiver (such terminal 12, col. 3, lines 20-23) comprising a light receiving element (22) having a light receiving plane for receiving the optical signal outputted from the multi-mode fiber (14) (the input plane is placed at the center of hole 32, see fig. 2, col. 3639 ; also fig. 2, col. 4, lines 40-44), and

a receptacle (such (22), in associated with hole (74)), for connecting to the multimode fiber to affix the output plane at a predetermined distance from the light-receiving plane (26) (see fig. 2, col. 4, lines 40-44).

Forrest et al disclose optical transmission system as discussed above and differ from the claimed invention in that Forrest et al do not specifically disclose a vertex of said at least one lens is located at a first predetermined distance from the input plane of the multi-mode fiber, the first predetermined distance being greater or less than a distance from the vertex of said at least one lens to a focal point of said at least one lens. However, arranging proper placement of the lens with respect to the multi-mode fiber optical cable is well known. Marcuse et al is cited to show such well known concept. In Fig. 6, and col. 3, lines 54-67 to col. 4, lines 1-25, Marcuse et al teach placement of the lens (62) with respect to the fiber (60). In such arrangement a point on the outer surface of the lens can be considered as the vertex of the lens, which has a predetermined distance (the predetermined distance is slightly greater than D_m , shown by the end point of the arrow (R)) from input plane of the fiber (the input of the plane of the fiber is the end of the fiber). Marcuse et al show that the first predetermined distance being is greater than the distance from the vertex of said at least one lens to a focal point of said at least one lens (F_r). Therefore, it would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to arrange such placement of the lens with respect to the fiber. One of ordinary skill in the art would have been motivated to do such in order to maximize coupling efficiency. Moreover, Forrest et al differ from the claimed invention in that Forrest et al do not specifically

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disclose that a predetermined distance is determined based on a core diameter of the multi-mode fiber, a diameter of the light-receiving plane, and a maximum angle among angles of modes of the optical signal outputted from the output plane of the multi-mode fiber which are capable of entering the light-receiving plane. However, arrangement of optical lens, such as lens for receiving light, relative to the multi-mode fiber optical cable is well known. Marcuse et al is cited to show such well known concept. In col. 3, lines 54-67 and col. 4, lines 1-25, Marcuse et al teach mathematical relationship between diameter of fiber core, radius of glass (lens) and refractive index (angles of the optical signal). Therefore, it would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to arrange placement of the lens and fiber in relation to each other. One of ordinary skill in the art would have been motivated to do such in order to maximize coupling efficiency.

Furthermore, the combination of Forrest et al and Marcuse et al differs from the claimed invention in that the combination does not disclose that the first predetermined distance is selected based on an eye opening factor of the multi-mode fiber and a power of the optical signal. However, it is well known to select such predetermined using various method of testing such as eye-opening factor and power. The testing method show how efficient the coupling of the lens with respect to the fiber.

Cunningham et al is cited to show such well known concept. In col. 8, lines 3-31, Cunningham et al teach the use of eye opening diagrams (see figs. 7A-7D) in multi-mode fiber. Therefore, it would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to perform testing and experiment using eye

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opening (diagrams) in order to locate an optimum placement off the lens with respect to the multi-mode fiber. One of ordinary skill in the art would have been motivated to do such in order to prevent coupling losses and provide maximum coupling efficiency.

Furthermore, the combination of Forrest et al, Marcuse et al and Cunningham et al disclose the use of multi-mode fiber and differs from the claimed invention in that the combination do not specifically disclose that the light receiving element receives a lower order mode of the optical signal and a higher order mode is prevented from entering the light-receiving plane of said light receiving element. However, since the multi-mode fiber carries different modes of optical signal, it is well known to provide a filter to select a particular mode. Auracher is cited to show such well known concept. In col. 1, lines 30-45, Auracher et al teach the use of mode filter to block a particular mode. Therefore, it would have been obvious to an artisan of ordinary skill in the art at the time the invention was made to select a particular mode and prevent other mode. One of ordinary skill in the art would have been motivated to do such in order to eliminate noise associated with particular signal.

Regarding claim 10, Forrest (fig. 2) shows the input plane (fiber 14) is placed at a position farther away from a vertex of the at least one lens (30) than the focal point.

Regarding claim 11, the light receiving element of Forrest is a Si PIN photodiode (col. 12, lines 22-23).

Response to Arguments

5. Applicant's arguments with respect to claims 1-11 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Norte (US Patent No. 5,963,349) is cited to show bi-directional data link.

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dalzid Singh whose telephone number is (571) 272-3029. The examiner can normally be reached on Mon-Fri 9am - 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on (571) 272--3022. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DS
June 11, 2005


M. R. SEDIGHIAN
PRIMARY EXAMINER